



Fatal cocaine intoxication in a body packer

Letalno trovanje kokainom kod *body packer*-a

Gordana Brajković*, Gordana Babić*, Jasna Jović Stošić**†, Gordana Tomašević‡, Dragana Rančić*, Vesna Kilibarda**†

*National Poison Control Centre, †Forensic Medicine and Pathology, Military Medical Academy, Belgrade, Serbia; ‡Faculty of Medicine of the Military Medical Academy, University of Defence, Belgrade, Serbia

Abstract

Introduction. ‘Body packer’ syndrome with severe intoxication or sudden death may happen in persons who smuggle drugs in their body cavities. In case of lethal outcome when carrying cocaine, it is important, but sometimes difficult to determine whether death was due to intoxication or due to other causes. Therefore, it is necessary not only to quantify cocaine and its metabolites in biological material, but also based on their distribution in body fluids and tissues to conclude whether it is acute intoxication. We described a well-documented case of fatal poisoning in a body packer and *post mortem* distribution of the drug in biological samples. **Case report.** A 26-year-old man was brought to hospital with no vital signs. Resuscitation measures started at once, but with no success. Autopsy revealed 66 packets of cocaine in his digestive tract, one of which was ruptured. Hyperemia of the most of all internal organs and pulmonary and brain edema were found. High concentrations of cocaine, its metabolites benzoylecgonine and ecgonine methyl ester, as well as cocaine adulteration levamisole were proven in the *post mortem* blood and tissues by liquid chromatography-mass spectrometry (LC-MS) method with selective-ion monitoring. **Conclusion.** The ratio of cocaine and its metabolites concentrations in the brain and blood obtained by LC-MS method can be used for forensic confirmation of acute intoxication with cocaine.

Key words:

cocaine; poisoning; deglutition; death, sudden; diagnosis, differential; chromatography.

Introduction

Body packers are individuals who transport illicit drugs, usually cocaine, heroin, or amphetamines in their bodies. This is a well-known method of smuggling illegal substances, which are packed into condoms or double latex balloons and then ingested in large numbers¹. Each individual packet contains a lethal

Apstrakt

Uvod. Kod osoba koje krijumčare drogu u svojim telesnim šupljinama može doći do pojave sindroma *body packer*, odnosno teškog trovanja, ili iznenadne smrti. U slučaju letalnog ishoda prilikom prenošenja kokaina, važno je, ali ponekad i jako teško, utvrditi da li je smrt nastupila usled intoksikacije. Zbog toga je značajno ne samo kvantifikovati kokain i njegove metabolite u biološkom materijalu, već i na osnovu njihove raspodele u telesnim tečnostima i tkivima zaključiti da li se radi o akutnoj intoksikaciji. Opisali smo dobro dokumentovani slučaj letalnog trovanja kod *body packer*-a i *post mortem* raspodelu droge u biološkim uzorcima. **Prikaz bolesnika.** Kod 26-godišnjeg mladića neposredno pre prijema u bolnicu došlo je do prestanka vitalnih funkcija. Na prijemu je pokušana reanimacija, koja je ostala bez odgovora. Prilikom obdukcije u gastrointestinalnom traktu nađeno je 66 paketića kokaina, od kojih je jedan ruptuirao. Patološkim pregledom otkrivena je hiperemija unutrašnjih organa, edem pluća i mozga. Primenom metode tečne hromatografije sa masenom spektrometrijom (LC-MS) u *post mortem* biološkom materijalu dokazane su visoke koncentracije kokaina, njegovih metabolita benzoilecgonina i ekgonin-metil-estra, kao i levamisola koji predstavlja dodatak kokainu. **Zaključak.** Odnos koncentracija kokaina i njegovih metabolita u mozgu i krvi koje su dobijene LC-MS metodom može se koristiti radi forenzičke potvrde akutne intoksikacije kokainom.

Ključne reči:

kokain; trovanje; gutanje; smrt, iznenadna; dijagnoza, diferencijalna; hromatografija.

quantity of narcotics. Sometimes intestinal obstruction may occur, but more dangerous is bursting of a packet with leakage of the content which may be rapidly fatal. These consequences are known as a “body packer” syndrome².

The Republic of Serbia is a part of the Balkan corridor and a transit country for narcotics. One of the well-known drug trafficking routes leads from Turkey and Afghanistan, through Ser-

bia, to Central and Western Europe^{3,4}. However, cocaine smuggling is usually conducted by air transport from South America (Brazil, Argentina, Uruguay), the Caribbean Islands (The Dominican Republic, Jamaica) and Central America (Costa Rica), and body packing is the method to do it.

Cocaine is most often taken intranasally (by snorting), or injected intravenously, but other routes are also possible, including oral (by chewing), inhalation (smoking), intravaginal and rectal application. The mucosal absorption of cocaine, in comparison to the intravenous one, achieves the maximum effect at a later time, but lasts longer⁵.

Cocaine is metabolized through enzyme and non-enzyme hydrolysis to benzoylecgonine. Ecgoninemethyl ester, the second major metabolite of cocaine, is created by a hydrolytic effect of cholinesterases⁶.

The toxic effects of cocaine usually appear when the concentrations of 0.25 to 0.5 mg/L are present in blood. Lethal outcomes have been recorded with the concentrations of 1.0 mg/L⁷.

Cocaine is unstable in *post mortem* samples due to its degradation and redistribution. Spiehler and Reed⁸, and later Kalasinsky et al.⁹, demonstrated that brain tissue is probably the most valuable sample for determining the concentration of cocaine and its metabolites, due to their uniform distribution in brain tissue, stability after freezing, and the absence of post mortem redistribution.

In case of lethal outcome when carrying cocaine, it is important, but sometimes difficult to determine whether the death was due to intoxication or due to other causes. Therefore, it is necessary not only to quantify cocaine and its metabolites in biological material, but also based on their distribution in body fluids and tissues to conclude whether it is acute intoxication. We described a well-documented case of fatal poisoning in a body packer and *post mortem* distribution of the drug in biological samples suggesting severe acute cocaine intoxication.

Case report

A 26-year-old man arrived at Belgrade Airport from the Dominican Republic. He was feeling seek, so left at the entrance of Emergency Department of the Military Medical Academy (MMA). At admission, the patient was without vital signs. Cardiopulmonary resuscitation (CPR) was initiated immediately, but with no response. A blood sample was taken for toxicological analysis during CPR. Analysis revealed the presence of high concentrations of cocaine (5.19 mg/L), its metabolites benzoylecgonine (3.1 mg/L) and ecgonine methyl ester (8.77 mg/L), as well as levamisole (1.57 mg/L).

Autopsy was performed due to "sudden" death. Sixty-six identical oval-shaped packets were retrieved from the body, with 3 packets being found in the stomach and the rest 63 in the intestines (Figure 1). One of them was ruptured. The overall weight of the contents was 700 g.

Analysis of one packet content was done, the remaining 65 packets were handed over to the police. The delivered packet was oval, 1.7 × 4.5 cm in diameter, containing 10 g of white powder densely packed into a latex sheath, similar to

the condom. It was tied at the open end, covered with several other layers of latex, and sealed with a hard wax coating. The outer layer consisted of a plastic bag. The remaining drug packets were of the same size and consistency, which suggested an automated process of packaging. Figure 2 shows a drug packet recovered from the patient. Cocaine powder was of 66.8% purity and contained levamisole as an adulterant.



Fig. 1 – Outlines of several oval-shaped drug packets can be seen in the intestines of the patient.



Fig. 2 – Drug packet recovered from the patient.

An autopsy exhibited hyperaemia in almost all of the patient's internal organs, including brain, heart, lung, kidney, spleen, liver and adrenal glands. Brain edema and pulmonary edema were also present.

Toxicological analysis confirmed the presence of cocaine, its metabolites and levamisole in the patient's internal organs, blood and urine samples.

The extracts of post mortem fluids (2 mL) and tissue specimens (2 g homogenate), were analyzed by liquid chromatography–mass spectrometry CLS-MS using with XTerra column, mobile phase ammonium formate: acetonitrile 5mM (pH 3.5) in the gradient mode. The ESI was operated in positive mode for the detection of cocaine, benzoylecgonine, ecgonine methyl ester and levamisole at the following mass to charge ratios (m/z): cocaine m/z 304→182, benzoylecgonine m/z 290 → 168, ecgonine methyl ester m/z 200→182, levamisole m/z 205 →178. Quantification of the substance in the samples was made

using a 5-point calibration curve, a validated method for cocaine, benzoylecgonine, ecgonine methyl ester and levamisole. The results of the *post mortem* toxicological analyses are shown in Table 1.

it can be found in the brain only if it was formed there. Having in mind the fact that at the moment of death blood flow and metabolism stop, relative amounts of cocaine and benzoylecgonine could be used for drawing conclusions

Table 1

Sample	Results of toxicological analyses in post mortem samples			
	Concentration (mg/L) (mg/kg*)			
	Cocaine	Benzoylecgonine	Ecgonine methyl ester	Levamisole
Blood	4.06	10.42	18.77	1.91
Urine	71.88	684.72	791.67	52.32
Liver with gall bladder	21.21	31.43	71.71	17.37
Kidney and bladder	24.93	16.00	30.91	20.54
Brain*	18.95	1.95	11.37	6.90
Heart, lung, spleen	9.21	8.43	15.96	8.04
Stomach	4.46	6.35	12.50	2.13
Small and large intestine	6.11	27.76	39.16	2.94

Discussion

We described probably the first case of body packer's death in Serbia caused by cocaine poisoning which was proved by autopsy and toxicological analyses (LC-MS method). The fatal intoxication occurred due to a leakage of one packet's content into the gastrointestinal tract. Analysis of the white powder retrieved from the packet confirmed the presence of cocaine and levamisole. Levamisole has been identified as a cocaine adulterant for more than a decade¹⁰. In 2010 the US Drug Enforcement Administration (DEA) reported that 79% of all cocaine seized in the United States contained levamisole¹¹. The mass fraction of levamisole in cocaine samples increased during the time, reaching about 50% or more in recent years in some countries¹². Our sample contained about 2/3 of cocaine and 1/3 of levamisole. Several potential mechanisms are proposed to explain why this particular drug is added to cocaine. Nicotinic effect of levamisole may result in increased release of norepinephrine and dopamine, enhancing sympathomimetic activity and elevating mood. Recently published study confirmed the metabolism of levamisole to the amphetamine-like compound aminorex, which may add to stimulating effect of cocaine¹³.

No safe concentration of cocaine in blood has been defined, but concentration greater than 5 mg/L usually results in severe intoxication or death¹⁴. In our case, concentration of cocaine in the sample obtained during resuscitation was 5.19 mg/L.

Cocaine rapidly metabolizes in the body to two major metabolites, benzoylecgonine and ecgonine methyl ester, and several minor metabolites¹⁵. As a result of hydrolysis in blood, concentration determined *post mortem* may not reflect the actual concentration in the body at the time of death. Accordingly, concentration of cocaine and its metabolites in brain tissue samples are important for interpreting the results. Benzoylecgonine does not cross the blood-brain barrier and

whether it is a case of acute or chronic exposure to cocaine. A high concentration of cocaine with a low or non-existent concentration of benzoylecgonine indicates acute poisoning. The presence of benzoylecgonine, without a parent compound in brain tissue, indicates the exposure that was a long time ago¹⁶. We have determined high concentration of cocaine (18.95 mg/kg) and much lower concentration of benzoylecgonine (1.95 mg/kg) in brain tissue sample suggesting acute overdose.

As cocaine readily crosses the blood-brain barrier and benzoylecgonine does not, in acute overdoses brain concentrations of cocaine may be several times higher, and of benzoylecgonine several times lower than those in plasma⁸. In the presented case, the brain/blood ratio for cocaine was approximately 4.67 and for benzoylecgonine was 0.15.

The highest cocaine concentrations were found in urine and the kidney, followed by the concentrations in the brain and the liver. These results are in agreement with previously reported tissue disposition of cocaine in acute fatal poisonings¹⁷.

Conclusion

Significant morbidity and mortality in body 'packer' syndrome are the direct results of cocaine absorption from the gastrointestinal tract. From the point of view of forensic toxicology analysis, isolated cocaine blood levels are not sufficient for the diagnosis of cause of death. They should always be considered and evaluated in relation to concentrations of cocaine and benzoylecgonine in body tissue compartments, especially in the brain. Brain tissue is a useful specimen for determination of cocaine and its metabolites, because concentrations are relatively stable and do not undergo *post mortem* redistribution. Accordingly, the ratio between cocaine and benzoylecgonine in the brain, as well as relative amounts of these substances in the brain and blood may indicate acute overdose.

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